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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
09/266,012	03/11/99	YAMAUCHI	0756-1947

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EXAMINER

RICHARDS, N

ART UNIT

PAPER NUMBER

2815

DATE MAILED: 02/15/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

# Office Action Summary

Application No.

09/266,012

Applicant(s)

YAMAUCHI ET AL.

Examiner

N. Drew Richards

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 13 December 1999.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-10 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-10 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claims \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are objected to by the Examiner.
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. § 119

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☒ Certified copies of the priority documents have been received in Application No. 08/617,121.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☒ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

## Attachment(s)

- 15) ☒ Notice of References Cited (PTO-892)
- 16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 17) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4.

- 18) ☐ Interview Summary (PTO-413) Paper No(s) \_\_\_\_\_
- 19) ☐ Notice of Informal Patent Application (PTO-152)
- 20) ☐ Other:

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

2. Claim 10 is rejected under 35 U.S.C. 102(e) as being anticipated by Tang et al. (U.S. Patent No. 5,550,066).

Tang et al. disclose an organic electroluminescence display device on columns 1-14 and in figures 1-9. More specifically, Tang et al. disclose a substrate 41 having an insulating surface, a thin film transistor formed over the substrate having an active layer comprising silicon including source, drain, and channel regions, a transparent electrode (anode electrode), an organic electroluminescence layer 82 adjacent to the transparent electrode, and a peripheral driving circuit comprising another thin film transistor. The structure of the organic electroluminescence display device can be seen in figure 8 and the second transistor can be seen in figure 2.

### *Claim Rejections - 35 USC § 103*

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

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invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's admitted prior art in view of Moeller et al. (U.S. Patent No. 4,511,756).

Applicant's admitted prior art teaches on page 1 line 8 through page 2 line 4 an organic electroluminescence display device. The admitted prior art device comprises a thin film transistor formed over a substrate having an active layer of silicon including a source, drain, and channel region. The admitted prior art does not explicitly state that it is formed on a substrate having an insulated surface, however it is well known to one of ordinary skill in the art at the time of the invention to form thin film transistors on insulating substrates. The admitted prior art also teaches an electrode comprising aluminum electrically connected to one of the source and drain regions having a barrier metal interposed between the electrode and the source or drain region to prevent a direct contact therebetween. The admitted prior art also teaches a transparent electrode electrically connected to the thin film transistor and an organic electroluminescence layer adjacent to the transparent electrode. The admitted prior art does not teach forming a barrier metal of titanium.

Moeller et al. teach a method of forming aluminum on silicon. Moeller et al. teach a barrier metal layer between the aluminum and the silicon. Moeller et al. teach on line 4 of the abstract using a barrier metal comprising titanium. With respect to claim 3, Moeller et al. teach that the barrier metal contains nitrogen.

Applicant's admitted prior art and Moeller et al. are combinable because they are from the same field of endeavor. At the time of the invention it would have been

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obvious to a person of ordinary skill in the art to provide a barrier metal of titanium nitride between the silicon source or drain and the aluminum electrode. The motivation for doing so is prevent diffusion of aluminum into the silicon source or drain region. Therefore, it would have been obvious to combine Applicant's admitted prior art with Moeller et al. to obtain the invention of claims 1 and 3.

5. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's admitted prior art with Moeller et al. (U.S. Patent No. 4,511,756) as applied to claim 1 above, further in view of Tang et al. (U.S. Patent No. 5,550,066).

Applicant's admitted prior art with Moeller et al. teach forming a transparent electrode but do not disclose forming it of indium tin oxide. Tang et al. teach an organic EL display device which has an indium tin oxide transparent electrode. Tang et al. and Applicant's admitted prior art are from the same field of endeavor. It would have been obvious to one of ordinary skill in the art at the time of the invention to use an indium tin oxide electrode as indium tin oxide (commonly referred to as ITO) is a well known and long established transparent conductor. Therefore, it would have been obvious to combine Applicant's admitted prior art and Moeller et al. with Tang et al. to obtain the invention of claim 2.

6. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tang et al. (U.S. Patent No. 5,550,066) in view of Applicant's admitted prior art.

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Tang et al. teach a substrate 41 having an insulating surface, a thin film transistor having an active layer of silicon, source, drain, and channel regions, and a transparent electrode electrically connected to one of the source and drain regions. Tang et al. also teach an organic electroluminescence layer adjacent to the transparent electrode and a counter electrode opposed to the transparent electrode with the organic electroluminescence layer interposed therebetween. Tang et al. also teach on column 10 line 18 that the counter electrode comprises magnesium and silver. Tang et al. does not teach a barrier metal layer interposed between the transparent electrode and the one of the source and drain regions to prevent a direct contact therebetween. Applicant's admitted prior art teaches providing a barrier metal between the transparent electrode and the one of the source and drain regions to prevent a direct contact therebetween.

Tang et al. and Applicant's admitted prior art are combinable because they are form the same field of endeavor. At the time of the invention it would have been obvious to one of ordinary skill in the art to form a barrier metal layer between the transparent electrode and the silicon active region. The motivation for doing so is to prevent diffusion of silicon into the electrode. Therefore, it would have been obvious to combine Tang et al. with Applicant's admitted prior art to obtain the invention of claim 4.

7. Claims 5-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tang et al. with Applicant's admitted prior art as applied to claim 4 above, and further in view of Moeller et al. (U.S. Patent No. 4,511,756).

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With regards to claim 5, Tang et al. with Applicant's admitted prior art does not teach forming the barrier layer comprising titanium. Moeller et al. teaches using a titanium barrier. It would have been obvious to one of ordinary skill in the art to use the titanium comprising barrier to prevent diffusion of the silicon into the electrode as discussed above.

With regards to claim 6, Tang et al. teach a device having a substrate with an insulating surface, a first thin film transistor having an active layer including source, drain and channel and a gate electrode adjacent to the channel, a second thin film transistor having an active layer including source, drain, and channel and a gate electrode adjacent to the channel, wherein the gate electrode of the second thin film transistor is electrically connected to the drain region of the first thin film transistor as seen in figures 1 and 8. Tang et al. also teaches a transparent electrode connected to the drain of the second thin film transistor and an organic electroluminescence layer disposed adjacent to the transparent electrode. Tang et al. does not teach a conductive layer disposed between the transparent electrode and the drain region of the second thin film transistor. Applicant's admitted prior art teaches a conductive metal (barrier layer) between the drain region and the transparent electrode. The motivation for combination is as stated above. Neither Tang et al. nor Applicant's admitted prior art teach that the conductive layer comprises titanium. Moeller et al. teach using a titanium barrier as discussed above.

With regard to claim 7, the titanium barrier of Moeller et al. is disclosed as titanium nitride.

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With regard to claim 8, Tang et al. teach a counter electrode opposed to the transparent electrode with the organic electroluminescence layer interposed therebetween, wherein the counter electrode comprises magnesium and silver.

With regard to claim 9, Tang et al. teach a thin film transistor formed over a substrate having an active silicon layer with source, drain and channel regions, a transparent electrode electrically connected to the thin film transistor, an organic electroluminescence layer adjacent to the transparent electrode, and a peripheral driving circuit comprising another thin film transistor formed over the substrate. Tang et al. do not teach an electrode comprising aluminum electrically connected to one of the source and drain regions and a barrier metal layer interposed between the electrode and the one of the source and drain regions to prevent a direct contact therebetween. This is taught by Applicant's admitted prior art to allow low resistance electrical communication with a diffusion barrier to prevent silicon diffusing from the active layer to the electrode. Applicant's admitted prior art does not teach the barrier metal comprising titanium. This is taught by Moeller et al. as discussed previously.

### ***Conclusion***

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Hiroto (U.S. Patent No. 5,578,166) and Hutchins et al. (U.S. Patent No. 5,384,267) teach that titanium and titanium nitride are well known barrier layers in conductive interconnects.



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Any inquiry concerning this communication or earlier communications from the examiner should be directed to N. Drew Richards whose telephone number is (703) 306-5946. The examiner can normally be reached on M-F 8:00-5:30; Every other Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Lee can be reached on (703) 308-1690. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.



NDR  
February 12, 2001



EDDIE C. LEE  
PRIMARY EXAMINER